



MISSION OPERATIONS  
AND DATA SYSTEMS DIRECTORATE



SPACE NETWORK CONTROL (SNC)  
CONFERENCE  
ON  
RESOURCE ALLOCATION  
CONCEPTS AND APPROACHES

December 12 & 13, 1990

N92-11040



— GODDARD SPACE FLIGHT CENTER  
GREENBELT, MARYLAND

—



**SPACE NETWORK CONTROL CONFERENCE ON RESOURCE ALLOCATION  
CONCEPTS AND APPROACHES**

**DECEMBER 12 - 13, 1990**

**WORKING GROUP DISCUSSION QUESTIONS**

**SUGGESTION:**

Keep a running list of concepts/issues that may be considered for SNC as you listen to the briefing.

**Examples:**

- Distributed systems and information access
- Locus of control
- Level of automation
- Timeline management
- Generic scheduling
- Impact of demand access
- Impact of "classes" of users on scheduling services

**SESSION 1. CONCEPTS FOR SPACE NETWORK RESOURCE ALLOCATION**

1. Identify the three most critical issues for Space Network Resource Allocation in terms of:
  - a. Management
  - b. Operations
  - c. SN User POCCs
  - d. System Development

Include a sentence or two, as needed, to explain/clarify each issue.

2. Select at least three of the critical issue above and suggest ways of resolving them. Address innovation and risk factors. Identify areas for further study and suggest study approaches.

3. Discuss how resource allocation might be performed for:

- a. Rescheduling in the event of a failure to the ATDRSS Ground Terminal.
- b. Scheduling of previously allocated resources that unexpectedly become available (e.g., shuttle launch slips).

4. Discuss the pros and cons of dividing the schedule timeline into forecast (batch) and active (incremental updates) periods. Suggest alternative schedule timeline approaches for SNC consideration.

5. Given that there are different user classes, discuss the pros and cons of subdividing available resources into multiple subnetworks based on user classes and demands for use by each user class.

## **SESSION 2. SNC AND USER POCC HUMAN-COMPUTER INTERFACE CONCEPTS.**

1. Using presentation materials as a baseline, provide a definition of "generic scheduling" and make recommendations for its use in terms of concept, requirements, and implementation approach. Discuss incentives to make generic scheduling an attractive option for user POCCs and provide rationale.
2. Discuss the pros and cons of redefining the user POCC scheduling interface in conjunction with defining the SNC scheduling interface to the POCCs. Address the potential for providing common tools for user POCCs.
3. Scheduling system user interfaces guidelines are not mature today and standards are not expected in the foreseeable future. Suggest steps that should be taken to incorporate human factors guidelines for the human computer interface into the system development process. Address risk areas.
4. Suggest an approach and discuss trade-offs for determining appropriate levels of automation for the SNC, for example, fully automated operations, human management by exception (supervisor role), human activated with computer assistance (computer recommends actions), or manual operations.

## **SESSION 3. RESOURCE ALLOCATION TOOLS, TECHNOLOGY, AND ALGORITHMS**

1. Identify at least three key performance parameters for the following viewpoints:

- a. User POCC
- b. SNC operability
- c. SN schedule efficiency
- d. System Implementation

Include a sentence or two, as needed, to explain/clarify each parameter.

2. Select at least three of the performance drivers above and suggest ways of satisfying them. Address application of AI and other techniques and risk areas.
3. Identify candidate SN resource allocation prototyping objectives. Provide rationale.

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SPACE NETWORK CONTROL (SNC)  
CONFERENCE ON  
RESOURCE ALLOCATION CONCEPTS  
AND APPROACHES

INTRODUCTION

DECEMBER 12, 1990

W. WATSON/530  
ASSISTANT CHIEF FOR  
NETWORK PLANNING

A-1

MO&DS  
DIRECTORATE

CODE 500


SPACE NETWORK CONTROL (SNC)  
CONFERENCE ON  
RESOURCE ALLOCATION CONCEPTS AND APPROACHES  
INTRODUCTION




GOALS FOR CONFERENCE ON RESOURCE ALLOCATION

- SURVEY EXISTING RESOURCE ALLOCATION CONCEPTS AND APPROACHES.
- IDENTIFY SOLUTIONS APPLICABLE TO THE SN PROBLEM.
- IDENTIFY FRUITFUL AVENUES OF INVESTIGATION IN SUPPORT OF SNC DEVELOPMENT.
- CAPTURE KNOWLEDGE IN PROCEEDINGS AND MAKE AVAILABLE TO BIDDERS ON THE SNC CONCEPT DEFINITION PROCUREMENT.

A-2


MO&DS DIRECTORATE  CODE 500	SPACE NETWORK CONTROL (SNC) CONFERENCE ON RESOURCE ALLOCATION CONCEPTS AND APPROACHES <b>INTRODUCTION</b>	
<p style="text-align: center;"><b><u>BACKGROUND</u></b></p> <ul style="list-style-type: none"> <li>• THE CURRENT NCC WORKS, PROVIDING A VARIETY OF SCHEDULING AND TECHNICAL MANAGEMENT FUNCTIONS FOR THE SPACE NETWORK (TDRSS), THE GROUND NETWORK (MILBDA, DKR) AND INTERFACE TO OTHER NETWORKS (DSN, RTS)</li> <li>• THE SPACE NETWORK IS CHANGING: <ul style="list-style-type: none"> <li>- TDRS CLUSTER ARCHITECTURES</li> <li>- WHITE SANDS GROUND TERMINAL COMPLEX</li> <li>- NEW ATRSS SERVICES</li> <li>- MIXED FLEET TDRS/ATDRS</li> <li>- INTERNATIONAL DATA RELAY SATELLITE INTEROPERABILITY</li> </ul> </li> <li>• AS THESE CHANGES PROGRESS, THE CURRENT NCC SYSTEM AND SOFTWARE ARCHITECTURE BECOMES INCREASINGLY DIFFICULT TO MAINTAIN.</li> </ul>		

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MO&DS DIRECTORATE  CODE 500	SPACE NETWORK CONTROL (SNC) CONFERENCE ON RESOURCE ALLOCATION CONCEPTS AND APPROACHES <b>INTRODUCTION</b>	
<p style="text-align: center;"><b><u>GOALS FOR SPACE NETWORK CONTROL</u></b></p> <ol style="list-style-type: none"> <li>1. DEVELOP A SYSTEM ARCHITECTURE CAPABLE OF ACCOMMODATING CHANGE <ul style="list-style-type: none"> <li>- HARDWARE</li> <li>- SOFTWARE</li> <li>- INTERFACES</li> <li>- SPAN OF CONTROL</li> </ul> </li> <li>2. IMPROVE SN USER SATISFACTION <ul style="list-style-type: none"> <li>- SN USER INTERFACE - VARYING LEVELS OF USER SOPHISTICATION &amp; NEED</li> <li>- % OF SUPPORT REQUESTS GRANTED - A SCHEDULING ISSUE</li> </ul> </li> <li>3. IMPROVE THE SN INSTITUTIONAL UTILIZATION AND EFFECTIVENESS <ul style="list-style-type: none"> <li>- SNC LIFE CYCLE COSTS: OPERATIONS AND SYSTEM MAINTENANCE</li> <li>- INCREASE THE UTILIZATION OF THE SN <ul style="list-style-type: none"> <li>5% INCREASE MAY SAVE THE COST OF AN ATDRS OVER THE 15 YEAR PROGRAM LIFE CYCLE (\$200M - \$300M)</li> <li>THIS IS BOTH A SCHEDULING AND SYSTEM RELIABILITY ISSUE</li> </ul> </li> </ul> </li> </ol>		

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MO&DS DIRECTORATE  CODE 500	SPACE NETWORK CONTROL (SNC) CONFERENCE ON RESOURCE ALLOCATION CONCEPTS AND APPROACHES <b>INTRODUCTION</b>	
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MO&DS DIRECTORATE  CODE 500	SPACE NETWORK CONTROL (SNC) CONFERENCE ON RESOURCE ALLOCATION CONCEPTS AND APPROACHES <b>INTRODUCTION</b>	
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MO&DS DIRECTORATE		GSFC 
CODE 500		
<p style="text-align: center;"><b>SNC Conference on Resource Allocation Concepts and Approaches</b></p> <p style="text-align: center;"><b>Conference Format</b></p> <p style="text-align: center;"><b>December 12, 1990</b></p> <p style="text-align: right;">K. Moe/522</p>		


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MO&DS DIRECTORATE	<b>SNC Conference Format</b>	GSFC 
CODE 500		
<p style="text-align: center;"><u><b>Conference Format</b></u></p> <ul style="list-style-type: none"> <li>• Conference Introduction</li> <li>• Session 1: Concepts for SN Resource Allocation</li> <li>• Session 2: SNC and User POCC Human-Computer Interface Concepts</li> <li>• Session 3: Resource Allocation Tools, Technology, and Algorithms</li> <li>• Working group discussions will follow each session</li> <li>• Each presentation will be approximately 20 minutes</li> <li>• Conference proceedings will be published early in 1991 and will contain: <ul style="list-style-type: none"> <li>- Presentation Slides/Presentation Papers</li> <li>- Working Group Results</li> </ul> </li> </ul>		


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MO&DS DIRECTORATE	SNC Conference Format	
CODE 500		
<p align="center"><u>Working Group Discussions</u></p> <ul style="list-style-type: none"> <li>Working groups will consist of: <ul style="list-style-type: none"> <li>Leader</li> <li>Recorder</li> <li>Approximately 8 members total</li> </ul> </li> <li>Working groups will address specific "questions to be answered" in the conference handout</li> <li>Leader and Recorder will be responsible for the documentation of working group efforts</li> <li>Everyone is encouraged to take notes during presentations to capture ideas</li> <li>Your participation and contributions to working group discussions are essential elements of this conference</li> </ul>		

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MO&DS DIRECTORATE	SNC Conference Format	
CODE 500		
<p align="center"><u>Working Group Discussions (Cont'd)</u></p> <ul style="list-style-type: none"> <li>Working Group Leaders <ul style="list-style-type: none"> <li>Dorothy Perkins</li> <li>Pepper Hartley</li> <li>Philip Liebrecht</li> <li>Candace Carlisle</li> <li>Vern Hall</li> <li>Doug McNulty</li> <li>BJ Hayden</li> </ul> </li> <li>Working Group Recorders <ul style="list-style-type: none"> <li>Eric Richmond</li> <li>Beth Antonopulos/Brian Dealy</li> <li>Lisa Karr</li> <li>Bill Potter</li> <li>Nancy Goodman</li> <li>Ken Johnson</li> <li>Karen Thorn</li> </ul> </li> </ul>		

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MOADS DIRECTORATE	SNC Conference Format	
CODE 500		

Agenda

**December 12, 1990**

8:00 - 8:30	Registration
8:30 - 9:30	Conference Introduction
9:30 - 11:15	Session 1: Concepts for SN Resource Allocation
11:15 - 12:15	Lunch
12:15 - 1:00	Session 1 (Cont'd)
1:00 - 3:30	Session 1 Working Group Discussions
3:30 - 5:00	Session 2: SNC and User POCC Human-Computer Interface Concepts

**December 13, 1990**

8:00 - 9:15	Session 2 (Cont'd)
9:15 - 11:15	Session 2 Working Group Discussions
11:15 - 12:15	Lunch
12:15 - 3:15	Session 3: Resource Allocation Tools, Technology, and Algorithms
3:15 - 5:00	Session 3 Working Group Discussions
5:00	Concluding Remarks

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# SCHEDULING OVERVIEW AND CHALLENGES

NOVEMBER 1990

A. LEVINE  
CODE 534.2

C-1

MO&DS  
DIRECTORATE

CODE 500

## SCHEDULING OVERVIEW AND CHALLENGES

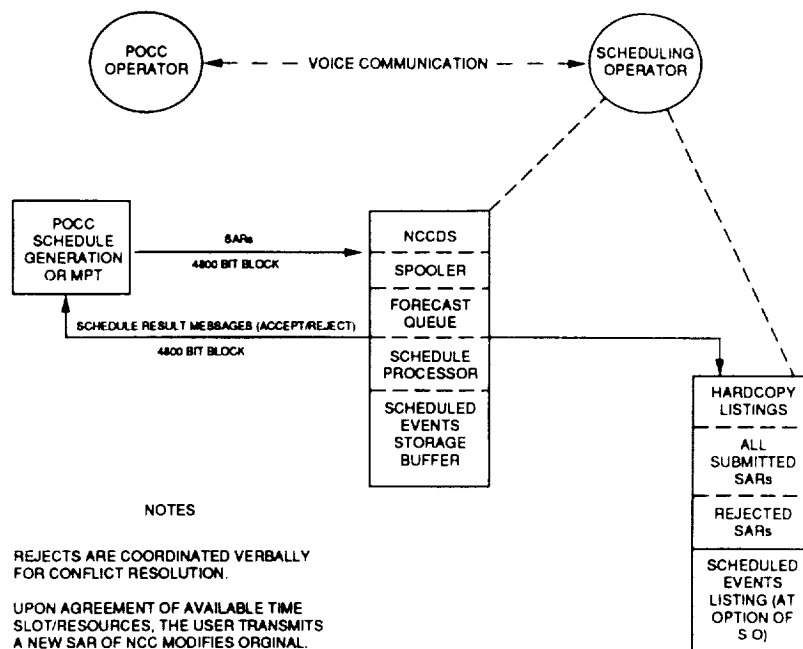


### INTRODUCTION

- THE NCC IS RESPONSIBLE FOR THE ALLOCATION OF SPACE NETWORK RESOURCES TO MEET AUTHORIZED USER REQUIREMENTS.
  - SCHEDULES TDRS AND WSGT
  - SCHEDULES NASCOM
  - SCHEDULES NASA GROUND TERMINAL
  - SCHEDULES SDPF



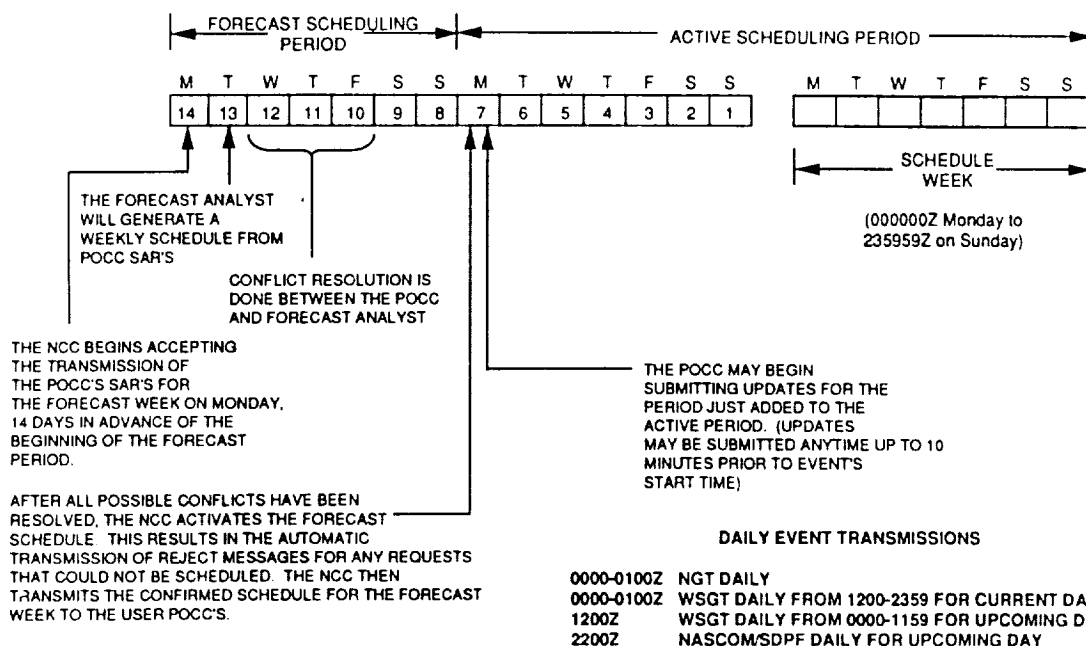
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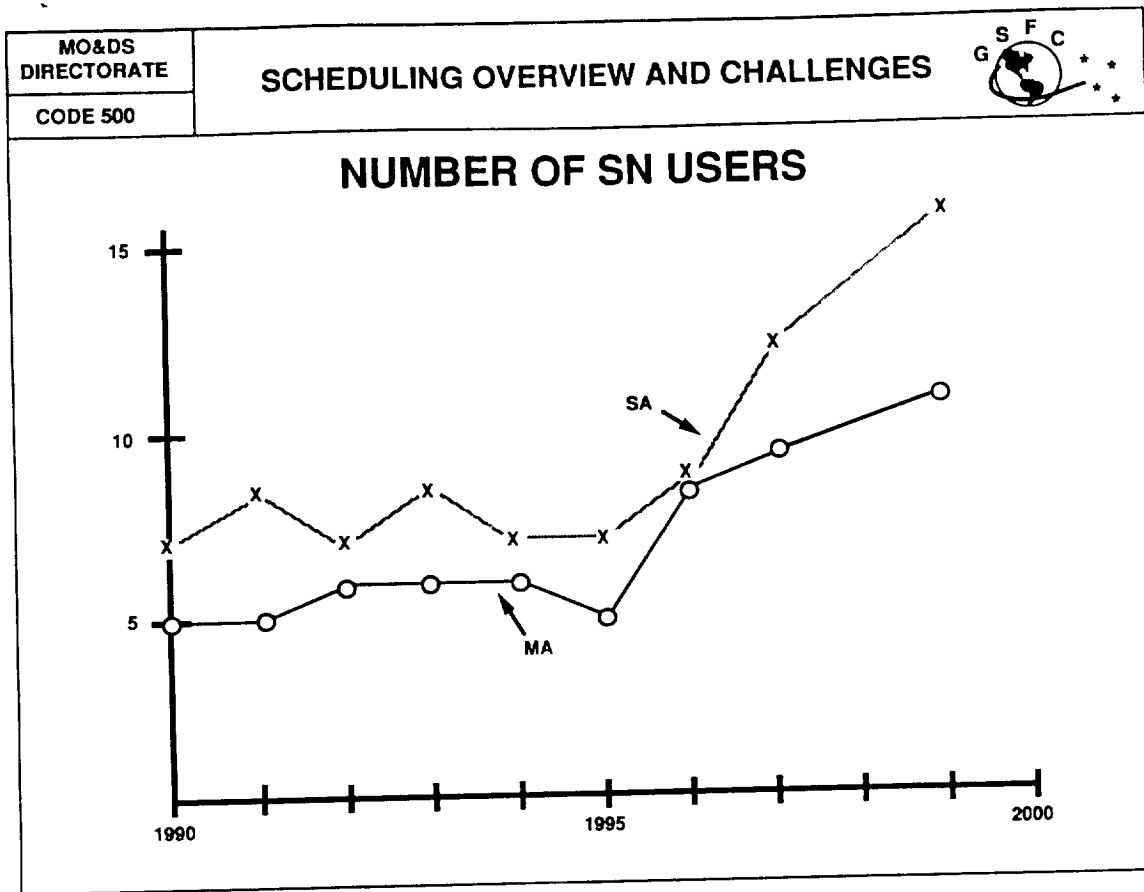
C-3



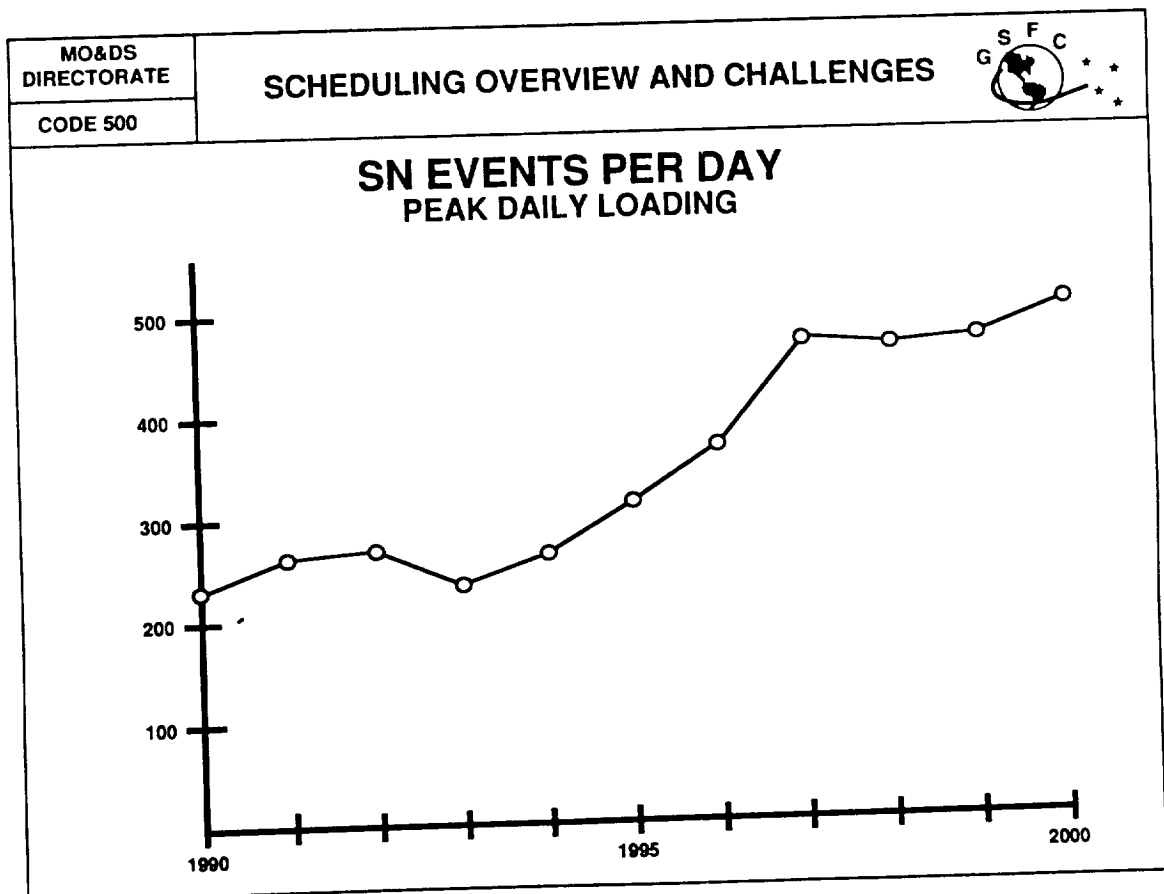
## SCHEDULING TIMELINE




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<b>MO&amp;DS DIRECTORATE</b>	<b>SCHEDULING OVERVIEW AND CHALLENGES</b>	
<b>CODE 500</b>		

## **SCHEDULING CHALLENGES**

- **CURRENT**
  - **EFFICIENT USE OF NETWORK RESOURCES**
  - **SCHEDULING SHUTTLE - MINIMIZE IMPACT ON OTHER USERS**
  - **USER POCC INTERFACE**
  - **REFINE FORECAST/ACTIVE PERIOD PROCEDURES**
  - **SCHEDULING AROUND RFI**
  - **BETTER TOOLS FOR CONFLICT RESOLUTION - EMPHASIS ON AIDING SCHEDULER, NOT REPLACE/AUTOMATE**

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<b>MO&amp;DS DIRECTORATE</b>	<b>SCHEDULING OVERVIEW AND CHALLENGES</b>	
<b>CODE 500</b>		

## **SCHEDULING CHALLENGES (CONTINUED)**

- **FUTURE**
  - **SCHEDULING CONTROL - MAN AND MACHINE FUNCTIONS**
  - **GENERIC SCHEDULING - TAKE INITIATIVE, DON'T REACT**
  - **TRANSITION**
    - **TDRSS TO ADRSS**
    - **NCC TO SNC**
  - **SSF SCHEDULING**
  - **INTERNATIONAL SPACE NETWORK INTEROPERABILITY**
  - **SPACECRAFT PROXIMITY OPERATIONS (E.G., SHUTTLE DELIVERY, SSF)**
  - **DEMAND ACCESS**

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